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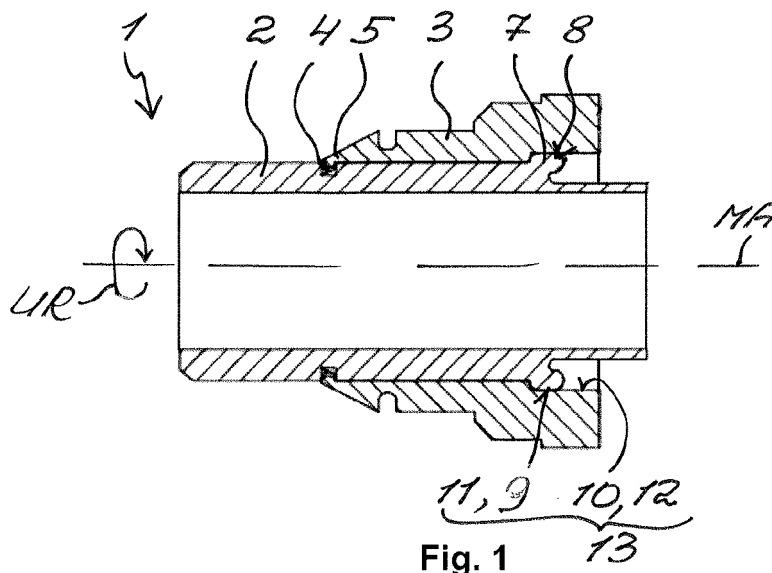
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(54) **COUPLING DEVICE**

(57) The invention relates to a coupling device (1) for connecting a heat exchanger to a standardized connector. The coupling device (1) comprises a tubular piece (2) and a hollow cylindrical adapter piece (3). The tubular piece (2) is inserted into the adapter piece (3) along a mounting axis (MA) to a predetermined distance and is

axially fixed to the adapter piece.

According to the invention, the coupling device (1) comprises a form-fitting unit (13) and the form-fitting unit (13) non-rotatably fixes the adapter piece (3) to the tubular piece (2).



Description

[0001] The invention relates to a coupling device for connecting a heat exchanger to a standardized connector according to the generic term of claim 1.

[0002] EP 2946136 A1 discloses a coupling device with a metallic pipe of a heat exchanger and a metallic adapter. The pipe and the adapter are connected to each other by brazing, which is disadvantageously time-consuming and cost-intensive. A VDA-Connector can then be fitted to the adapter. The VDA-Connector is a connector standardized by the German Association of the Automotive Industry for devices in a motor vehicle.

[0003] It is therefore the object of the invention to provide an improved or at least alternative embodiment for a coupling device of the type described, in which the disadvantages described are overcome.

[0004] This object is solved according to the invention by the object of independent claim 1. Advantageous embodiments are the subject of the dependent claims.

[0005] A coupling device is provided for connecting a heat exchanger to a standardized connector. In particular, the standardized connector is a VDA-Connector standardized by the German Association of the Automotive Industry for devices in a motor vehicle. The coupling device thereby comprises a tubular piece and a hollow cylindrical adapter piece. The tubular piece is inserted into the adapter piece i.e. the adapter piece is slid onto the tubular piece along a mounting axis to a predetermined distance and the tubular piece is axially and preferably detachably fixed to the adapter piece. According to the invention, the coupling device comprises a form-fitting unit and the form-fitting unit non-rotatably fixes the adapter piece to the tubular piece.

[0006] In the present invention, the terms "radial" and "axial" and "circumferential" always refer to the mounting axis.

[0007] Due to the form-fitting unit, the tubular piece and the adapter piece are non-rotatably fixed and a material connection between the tubular piece and the adapter piece can be avoided. This can simplify the manufacture of the coupling device and reduce manufacturing costs. Moreover, material-non-bondable materials can be used for the tubular piece and the adapter piece. Advantageously, the tubular piece may be formed from metal and the adapter piece may be formed from plastic.

[0008] In an advantageous embodiment, the form-fitting unit may comprise a first form-fitting element and a second form-fitting element. The first form-fitting element may be formed on the tubular piece, and the second form-fitting element may be formed on the adapter piece. The first form-fitting element and the second form-fitting element may be axially insertable into one another and can be non-rotatably fixed to one another in a rotationally fixed manner in a circumferential direction surrounding the mounting axis. In this way, during assembly of the coupling device, the form-fitting elements can be inserted into one another and subsequently non-rotatably fixed

the adapter piece to the tubular piece.

[0009] In an advantageous embodiment of the coupling device, it may be provided that the tubular piece comprises an outer stop projection and the adapter piece comprises an inner stop recess. The stop projection is formed externally on the tubular piece and the stop recess is formed internally in the adapter piece. The stop projection and the stop recess are each formed to surround the mounting axis at least in certain regions. The stop projection thereby engages radially in the stop recess and, as a result, the adapter piece lies on the tubular piece axially in one direction. In other words, the stop projection and the stop recess form an axial stop for the adapter piece on the rotor piece.

[0010] Transversely to the mounting axis, the tubular piece can contain an outer contour lying on the outside of the stop projection and the adapter piece can contain an inner contour lying on the inside of the stop recess. The outer contour and the inner contour may be fit tightly to each other and may be rotationally asymmetrical. The inner contour and the outer contour enable the stop projection and the stop recess and, correspondingly, the tubular piece and the adapter piece to be non-rotatably fixed to one another in a circumferential direction surrounding the mounting axis.

[0011] Accordingly, the first form-fitting element may be represented by the outer contour of the tubular piece at the stop projection and the second form-fitting element may be represented by the inner contour of the adapter piece at the stop recess. The outer contour of the tubular piece at the stop projection and the inner contour of the adapter piece at the stop recess may each be polygonal.

[0012] In an advantageous embodiment of the coupling device, it may be provided that the tubular piece comprises a locking groove and the adapter piece comprises at least one locking element. The locking groove is formed on the outside of the tubular piece and surrounds at least in regions the mounting axis. The at least one locking element is axially aligned and is radially resiliently formed on the adapter piece. The at least one locking element engages radially in the locking groove and the adapter piece is axially and preferably detachably fixed to the tubular piece. In addition, a radially inwardly directed projection may be formed at the end of the at least one locking element. The projection may engage radially in the locking groove, and thereby the at least one locking element may be securely fixed in the locking groove. A plurality of locking elements may be formed on the adapter piece and may be arranged side by side in a circumferential direction surrounding the mounting axis. The plurality of locking elements may be formed, for example, on the longitudinal end of the adapter piece by axially aligned cuts.

[0013] Advantageously, the coupling device may comprise a hollow cylindrical standardized connector. The adapter piece is then inserted into the standardized connector along the mounting axis. The standardized connector can then be axially and preferably detachable

fixed to the adapter piece. In particular, the standardized connector may be a VDA-Connector, as already described above. An outer contour of the adapter piece can be adapted to an inner contour of the standardized connector in such a way that the adapter piece and the standardized connector can be axially fixed to each other.

[0014] Other important features and advantages of the invention will be apparent from the sub-claims, from the drawings and from the accompanying figure description with reference to the drawings.

[0015] It is understood that the above features, and those to be explained below, may be used not only in the combination indicated in each case, but also in other combinations or alone, without departing from the scope of the present invention.

[0016] Preferred embodiments of the invention are shown in the drawings and will be explained in more detail in the following description, wherein like reference signs refer to like or similar or functionally identical components.

[0017] It shows, in each case schematically

Fig. 1 a sectional view of a coupling device according to the invention with a tubular piece and an adapter piece;

Fig. 2 a view of the tubular piece of the coupling device according to the invention;

Fig. 3 a view of the adapter piece of the coupling device according to the invention.

[0018] Fig. 1 shows a sectional view of a coupling device 1 according to the invention with a tubular piece 2 and a hollow cylindrical adapter piece 3. The tubular piece 2 is insertable into the adapter piece 3 along a mounting axis MA. The tubular piece 2 is made of metal and the adapter piece 3 is made of plastic. Fig. 2 shows a view of the tubular piece 2 and Fig. 3 shows a view of the adapter piece 3.

[0019] The tubular piece 2 contains a locking groove 4 and the adapter piece 3 contains a plurality of locking elements 5. The locking groove 4 is formed on the outside of the tubular piece 2 and surrounds the mounting axis MA. The locking elements 5 are arranged side by side on the adapter piece 3 in a circumferential direction UR surrounding the mounting axis MA, and are separated by a plurality of axially aligned cuts 6. As a result, the locking elements 5 are axially aligned and are radial resilient. As shown in Fig. 1, the locking elements 5 engage radially in the locking groove 4 and axially and preferably detachably fix the adapter piece 3 to the tubular piece 2.

[0020] The tubular piece 2 also contains a stop projection 7 surrounding the mounting axis MA and the adapter piece 3 contains a stop recess 8 surrounding the mounting axis MA. The stop projection 7 is formed on the outside of the tubular piece 2 and the stop recess 8 is formed on the inside of the adapter piece 3. As shown in Fig. 1,

the stop projection 7 and the stop recess 8 abut axially on one another, so that the stop projection 7 and the stop recess 8 form an axial stop for the adapter piece 3 on the tubular piece 2.

[0021] Transversely to the mounting axis MA, the tubular piece 2 contains a polygonal outer contour 9 at the stop projection 7 and the adapter piece 3 contains a polygonal inner contour 10 at the stop recess 8. The outer contour 9 and the inner contour 10 are adjacent to each other and are rotationally asymmetrical. Thus, once the tubular piece 2 is disposed in the adapter piece 3, the outer contour 9 and the inner contour 10 prevent the adapter piece 3 from rotating against the tubular piece 3. As a result, the tubular piece 2 and the adapter piece 3 are non-rotatably fixed to each other. The outer contour 9 of the tubular piece 2 at the stop projection 7 forms a first form-fitting element 11 of a form-fitting unit 13, and the inner contour 10 of the adapter piece 3 at the stop recess 8 forms a second form-fitting element 12 of the form-fitting unit 13.

[0022] Thus, by means of the form-fitting unit 13, the tubular piece 2 and the adapter piece 3 are non-rotatably fixed and a conventionally necessary material-boding between the tubular piece 2 and the adapter piece 3 can be avoided. This can simplify the manufacture of the coupling device 1.

[0023] The coupling device 1 is provided for connecting a heat exchanger of a motor vehicle to a standardized connector. Thereby, the tubular piece 2 may form a part of the heat exchanger and the adapter piece 3 may be adapted with its outer contour to an inner contour of the standardized connector. The standardized connector may in particular be a VDA-Connector as described above.

Claims

1. Coupling device (1) for connecting a heat exchanger to a standardized connector,

- wherein the coupling device (1) comprises a tubular piece (2) and a hollow cylindrical adapter piece (3),
- wherein the tubular piece (2) is inserted into the adapter piece (3) along a mounting axis (MA) to a predetermined distance and is axially fixed to the adapter piece (3),

characterized

in that the coupling device (1) contains a form-fitting unit (13) and the form-fitting unit (13) non-rotatably fixes the adapter piece (3) to the tubular piece (2).

2. Coupling device according to claim 1,

characterized

in that the tubular piece (2) is made of metal and the adapter piece (3) is made of plastic.

3. Coupling device according to claim 1 or 2,
characterized

- **in that** the form-fitting unit (13) comprises a first form-fitting element (11) and a second form-fitting element (12),
- **in that** the first form-fitting element (11) is formed on the tubular piece (2) and the second form-fitting element (12) is formed on the adapter piece (3), and
- **in that** the first form-fitting element (11) and the second form-fitting element (13) are insertable into each other along the mounting axis (MA) and interlock in a circumferential direction (UR) surrounding the mounting axis (MA) in a form-fitting manner.

4. Coupling device according to any one of the preceding claims,
characterized

- **in that** the tubular piece (2) contains an outer stop projection (7) which at least partially surrounds the mounting axis (MA),
- **in that** the adapter piece (3) contains an inner stop recess (8) which at least partially surrounds the mounting axis (MA), and
- **in that** the stop projection (7) engages radially in the stop recess (8) and thereby the adapter piece (3) abuts axially against the tubular piece (2).

5. Coupling device according to claim 4,
characterized

- **in that** the tubular piece (2) contains an outer contour (9) arranged transversely to the mounting axis (MA) and lying on the outside at the stop projection (7),
- **in that** the adapter piece (3) contains an inner contour (10) arranged transversely to the mounting axis (MA) and lying on the inside at the stop recess (8),
- **in that** the outer contour (9) and the inner contour (10) abut each other and are rotationally asymmetrical.

6. Coupling device according to claim 3 and 5,
characterized

in that the first form-fitting element (11) is formed by the outer contour (9) of the tubular piece (2) on the stop projection (7) and the second form-fitting element (12) is formed by the inner contour (10) of the adapter piece (3) on the stop recess (8).

7. Coupling device according to claim 5 or 6,
characterized

in that the outer contour (9) of the tubular piece (2)

at the stop projection (7) and the inner contour (10) of the adapter piece (3) at the stop recess (8) are each polygonal.

8. Coupling device according to any one of the preceding claims,
characterized

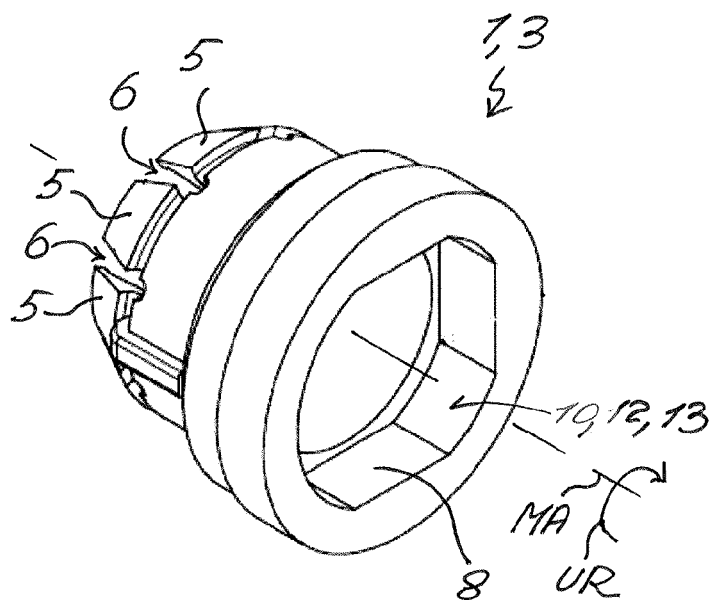
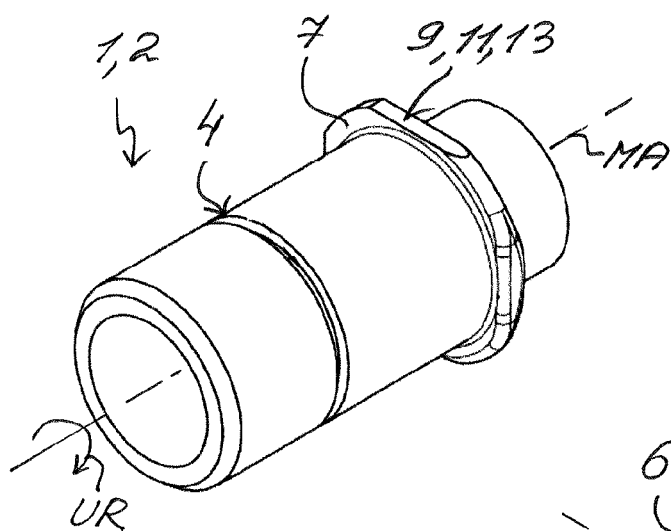
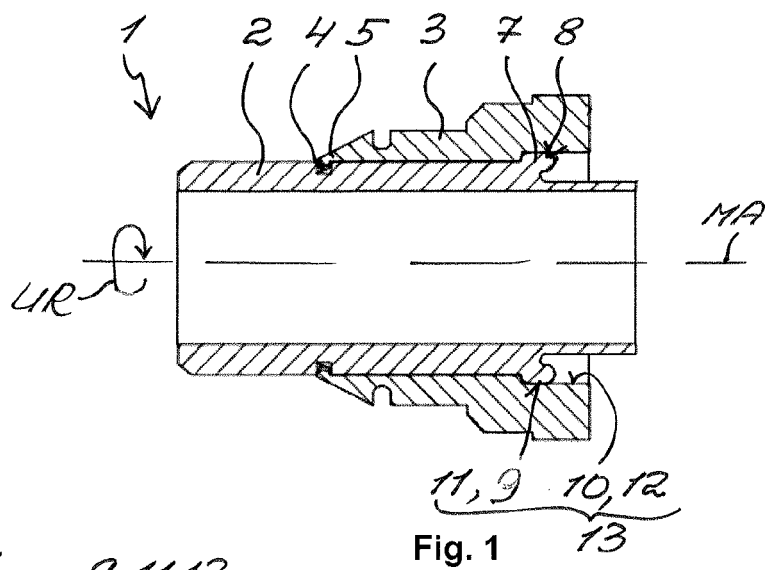
- **in that** the tubular piece (2) contains an outer locking groove (4) surrounding the mounting axis (MA) at least in some areas and the adapter piece (3) contains at least one resilient locking element (5) aligned axially, and
- **in that** the at least one locking element (5) of the adapter piece (3) engages radially in the locking groove (4) of the tubular piece (2) and thereby the adapter piece (3) is axially fixed to the tubular piece (2).

9. Coupling device according to any one of the preceding claims,
characterized

- **in that** the coupling device (1) comprises a hollow cylindrical standardized connector,
- **in that** the adapter piece (3) is inserted into the standardized connector along the mounting axis (MA), and
- **in that** the standardized connector is axially fixed to the adapter piece (3).

10. Coupling device according to claim 9,
characterized

in that an outer contour of the adapter piece (3) is adapted to an inner contour of the standardized connector in such a way that the adapter piece (3) and the standardized connector can be axially fixed to one another.





EUROPEAN SEARCH REPORT

Application Number

EP 21 21 2584

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The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 13 April 2022	Examiner Martínez Rico, Celia
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document	

**ANNEX TO THE EUROPEAN SEARCH REPORT
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